Partner Reported Opportunities (PROs)
For Reducing Methane Emissions

Convert Engine Starting to Nitrogen

Compressors/Engines ■
Dehydrators □
Pipelines □
Pneumatics/Controls □
Tanks □
Valves □
Wells □
Other □

Applicable sector(s):

■ Production ■ Processing ■ Transmission and Distribution

Partners reporting this PRO: Enron Corporation, Marathon Oil Company

Other related PROs: Install Electric Starters, Reduce Frequency of Engine Starts with Gas, Install Instrument Air Systems, Install Electric Compressors

Technology/Practice Overview

Description

Internal combustion engines that power pumps, compressors, and generators frequently use high pressure natural gas stored in a volume tank as an energy source for starting. The gas is expanded across a small turbine motor that turns the engine until it starts. Starter motor gas is typically vented to the atmosphere.

Partners have eliminated methane emissions from engine starts by replacing natural gas with compressed nitrogen. This practice simply fills the start-up volume tank with compressed nitrogen as necessary to support the frequency of engine start-ups. No facility changes are necessary except a high pressure nitrogen fill connection.

Methane Savings

1,350 Mcf/yr

Costs

Capital Costs (including installation)
■ <$1,000 □ $1,000-$10,000 □ >$10,000

Operating and Maintenance Costs (Annual)
□ <$100 ■ $100-$1,000 □ >$1,000

Payback (Years)

■ 0-1 □ 1-3 □ 3-10 □ >10

Principal Benefits

Reducing methane emissions was:

■ **A primary justification for the project** □ **An associated benefit of the project**

Operating Requirements

Either the high pressure start-up gas system must be very tight (no leakage) or nitrogen re-supply made just prior to start-ups to assure an adequate volume of high pressure nitrogen. Re-supply of compressed nitrogen must be arranged on a schedule coinciding with engine start-up frequency.

Applicability

This practice is applicable to all compressors with gas pneumatic starter motors.

Methane Emission Reductions

Conversion to nitrogen completely eliminates the venting of methane to the atmosphere and the leakage of methane through the gas shut-off valve. Typical production site compressor engine start-ups vent 1 to 5 Mcf of gas with each attempt, while field engines often require multiple attempts. Blowdown valves of a size and pressure differential similar to the gas shut-off valve leak up to 150 cfh or 1.3 MMcf/yr.

Economic Analysis

Basis for Costs and Savings

Methane emission reductions of 1,350 Mcf/yr apply to converting one start-up volume tank to nitrogen supporting ten engine starts per year. The volume tank is filled prior to start up to avoid leakage losses of nitiogen.

Discussion

This practice can payback quickly. The cost of compressed pipeline quality nitrogen is about $5 per Mcf delivered within 50 miles from commercial supply. For compressed nitrogen supply coinciding with start-ups, the value of avoided natural gas loss from leakage and start-up vents may off-set nitrogen cost. An associated benefit is reduced gas starter corrosion and maintenance costs when replacing the use of sour gas with nitrogen.